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Taguchi

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(54) **IMAGE FORMING APPARATUS PROVIDED WITH PROCESS CARTRIDGE**

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G03G 15/00 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 21/1803*** (2013.01); ***G03G 15/50*** (2013.01)

(58) **Field of Classification Search**
CPC G03G 21/1821; G03G 21/181
See application file for complete search history.

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(57) **ABSTRACT**

An image forming apparatus includes a housing; a process cartridge; and a protective member. The process cartridge is detachably attached to the housing and includes a drum unit; and a developing unit. The drum unit includes a photosensitive member. The developing unit includes a developing roller; and a first wall. The developing roller defines a first axis extending in an axial direction and is configured to rotate about the first axix. The first wall has a first surface; and a second surface opposite thereto. The first surface extends in the axial direction and faces the developing roller. The protective member is detachably attached to the process cartridge and includes a spacer. The drum unit includes a second wall. The second wall has a third surface. The third surface extends in the axial direction and faces the second surface. The spacer is disposed between the second surface and the third surface.

16 Claims, 13 Drawing Sheets

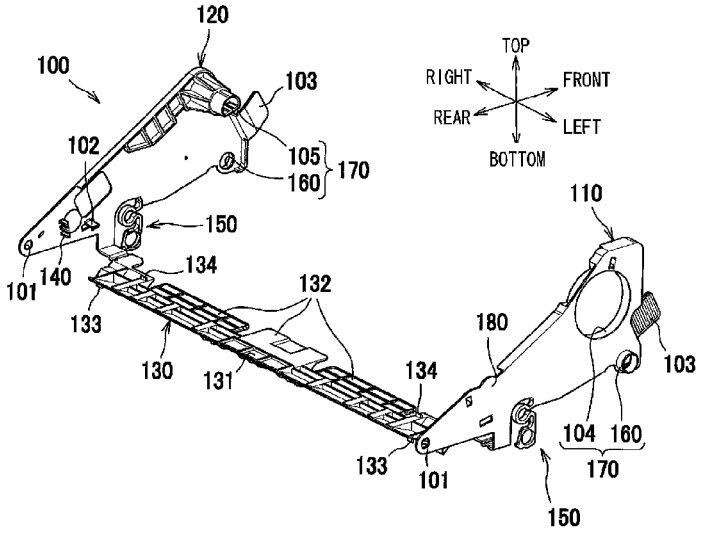
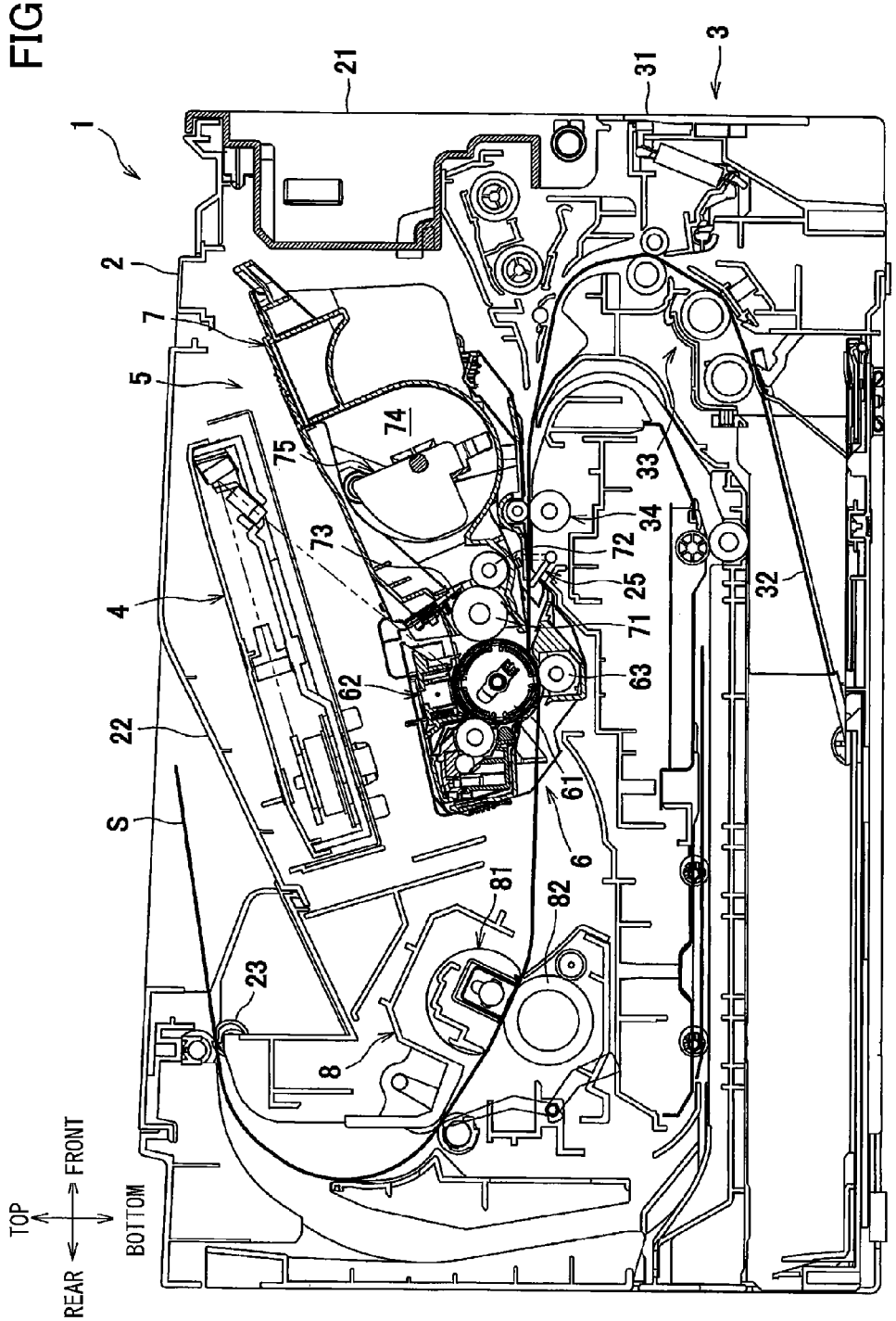


FIG.1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31
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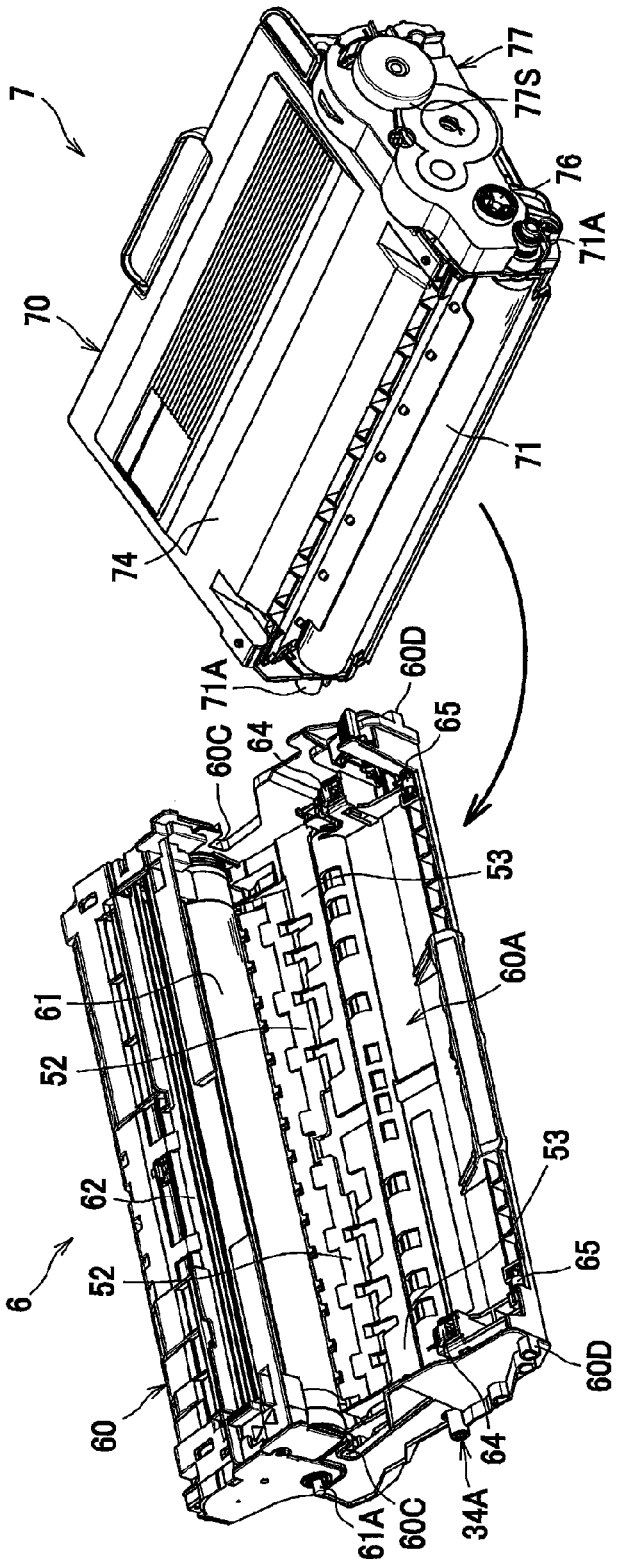
73
74
75
81
82
S
TOP
BOTTOM
FRONT
REAR

FIG. 2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77
77S
76
71A
70
71
74
71A
60D
65
64
60C
53
60A
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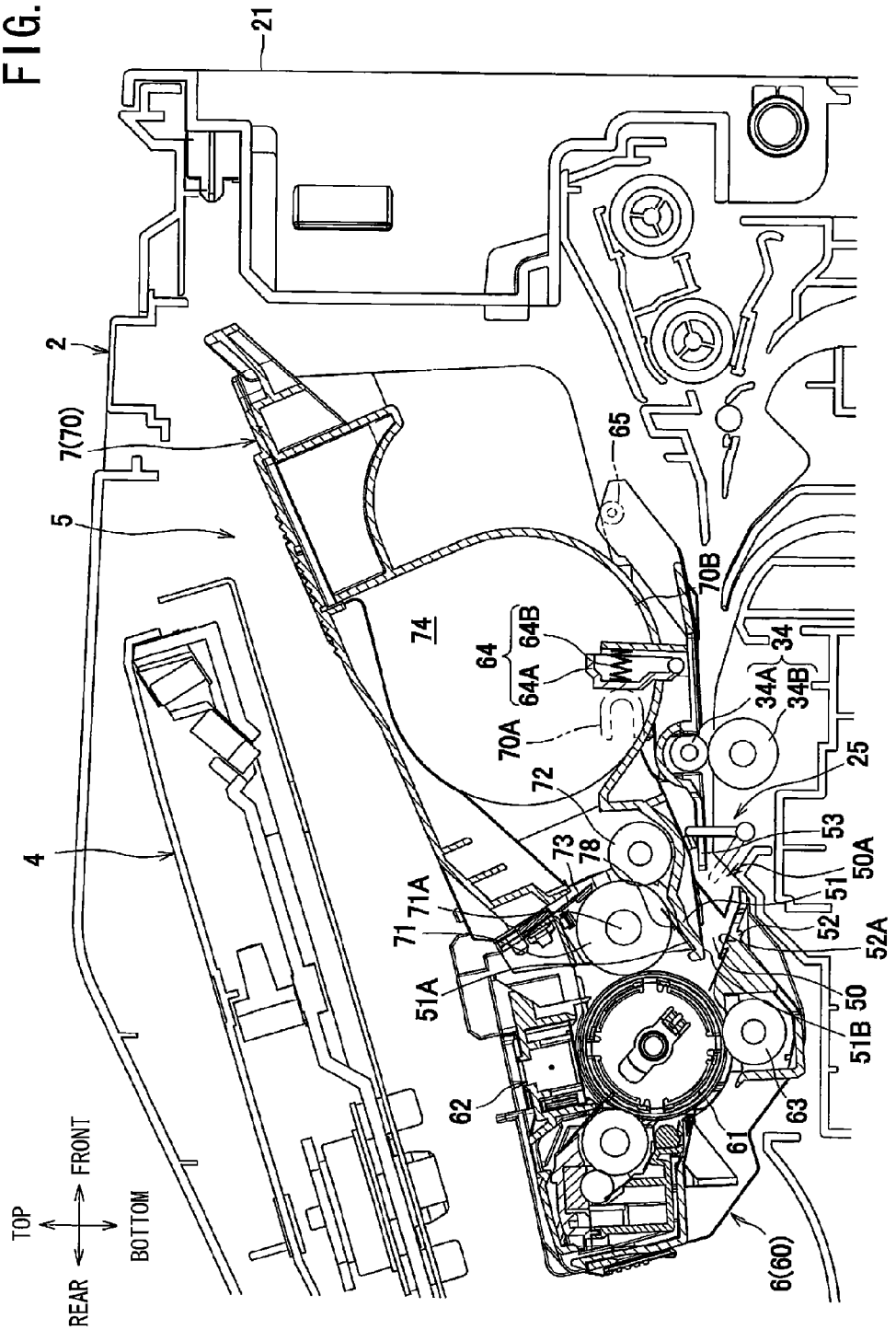
52
62
52
53
65
60D
6
60
64
34A
60C
61A

FIG. 3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7(70)
5
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74
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64B
64A
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34B
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53
73
78
50A
71
71A
51
52
52A
51A
50
51B
62
63
61
6(60)
TOP
FRONT
REAR
BOTTOM

FIG. 4

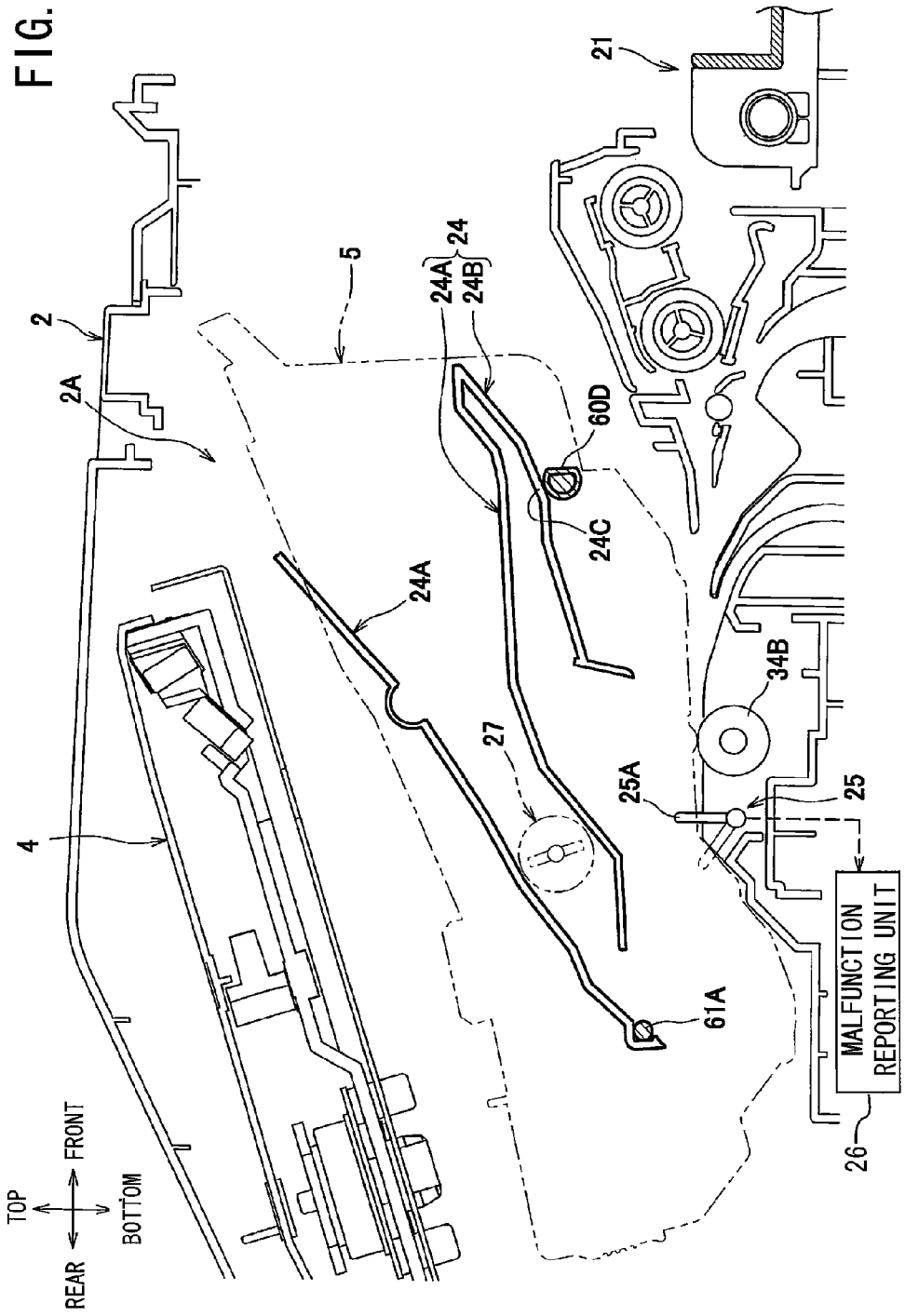
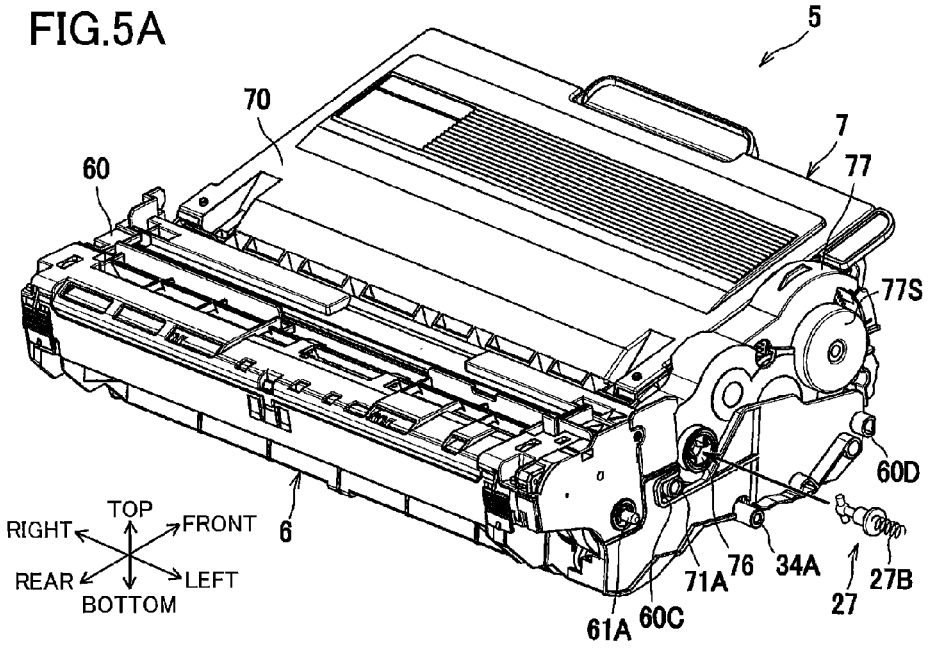

21
2
2A
5
24
24A
24B
60D
24C
24A
34B
27
25A
25
4
61A
MALFUNCTION REPORTING UNIT
26
TOP
FRONT
REAR
BOTTOM

FIG.5A


5
70
7
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77S
60D
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6
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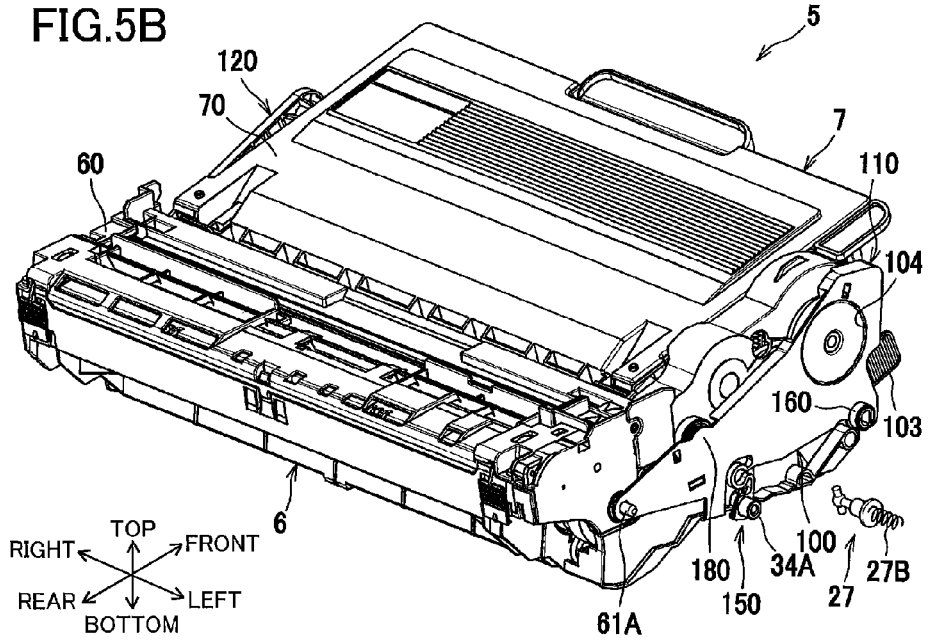
BOTTOM
71A
76
34A
27
27B
61A
60C

FIG.5B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FRONT
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LEFT
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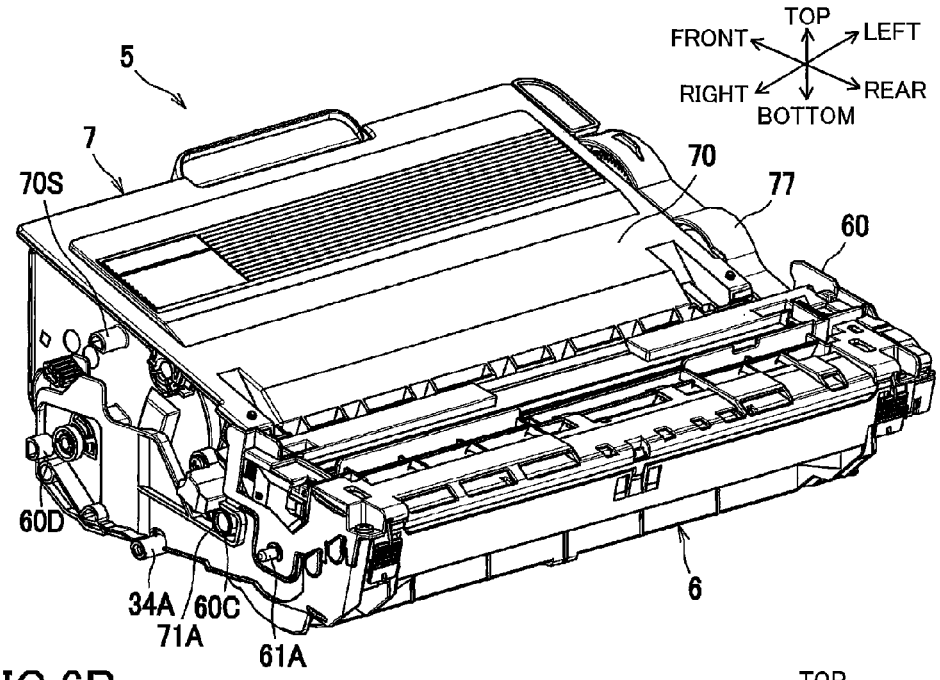
150
100
34A
27
27B
61A

FIG.6A


TOP
FRONT
LEFT
RIGHT
REAR
BOTTOM
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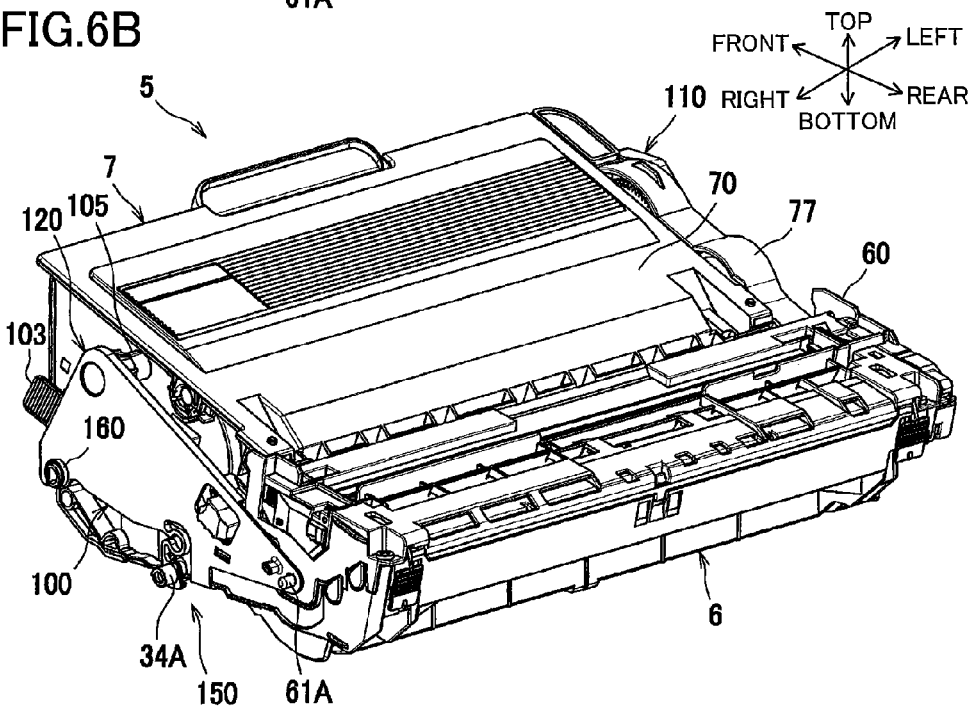
7
70S
70
77
60
60D
34A
60C
71A
61A
6

FIG.6B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FRONT
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REAR
BOTTOM
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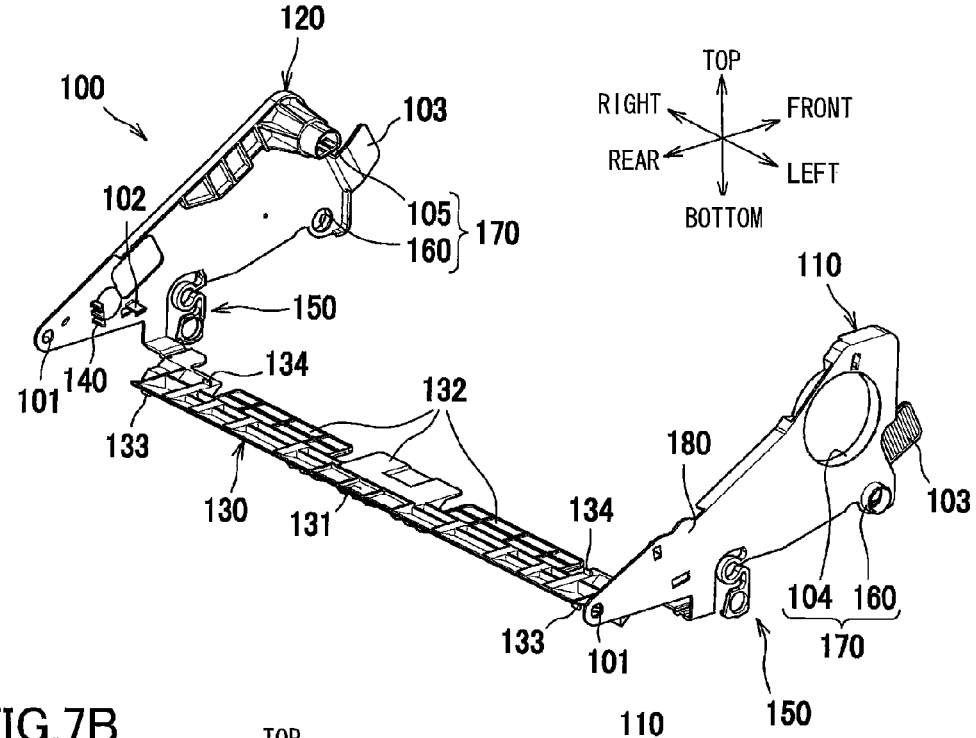
110
7
120
105
70
77
60
103
160
100
34A
150
61A
6

FIG.7A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LEFT
BOTTOM
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160
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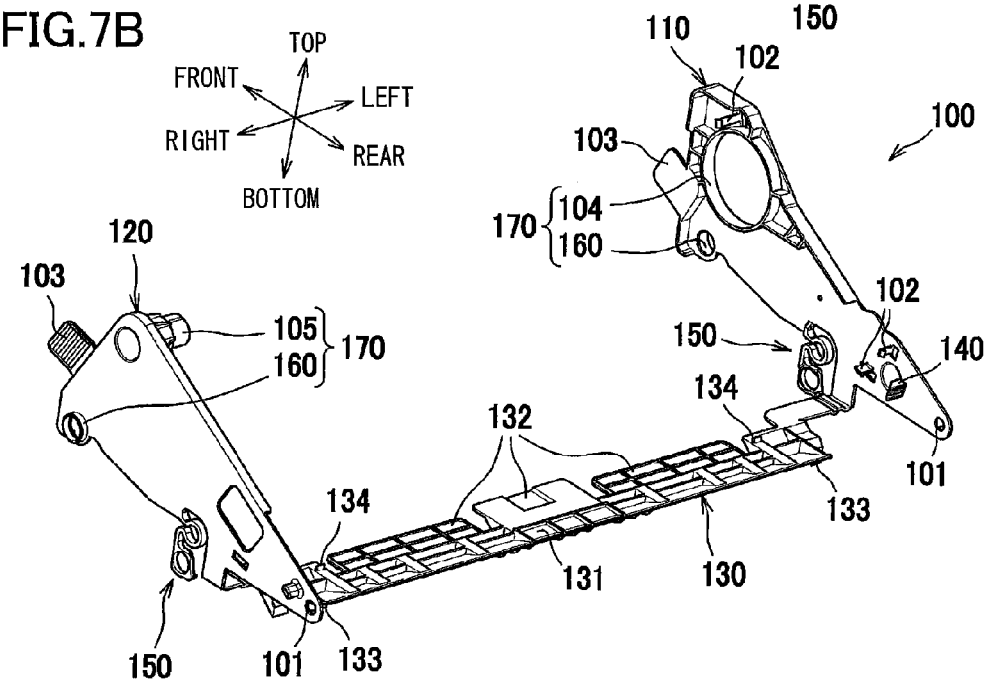
133
180
130
131
103
104
160
170
133
101
150

FIG.7B


TOP
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REAR
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110
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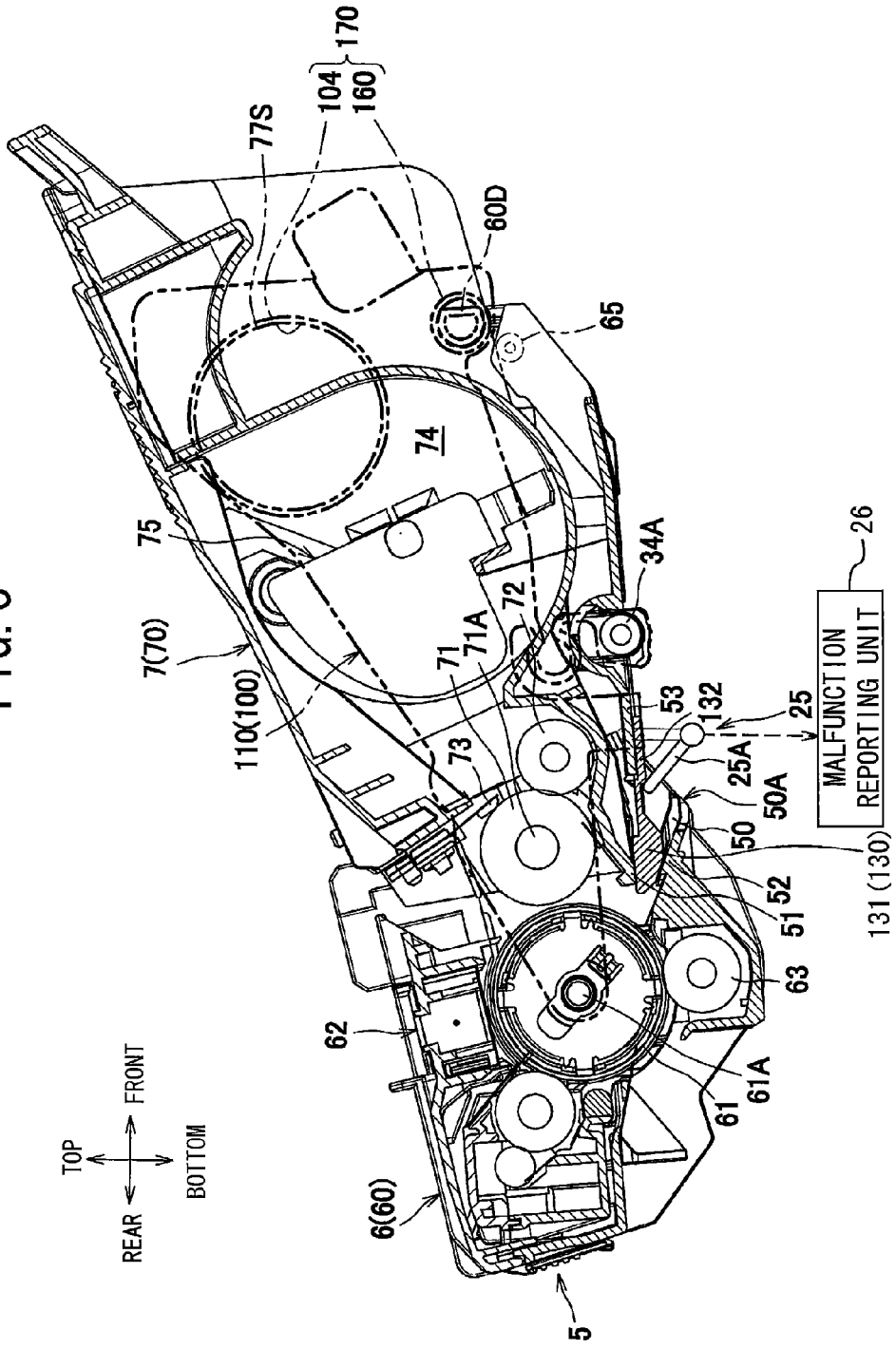
140
134
132
101
133
134
131
130
150
101
133

FIG. 8


170
104
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77S
60D
65
74
75
34A
72
71
71A
7(70)
110(100)
73
53
132
25
25A
50A
50
52
51
131 (130)
MALFUNCTION REPORTING UNIT
26
63
62
61
61A
6(60)
5
TOP
FRONT
REAR
BOTTOM

FIG.9

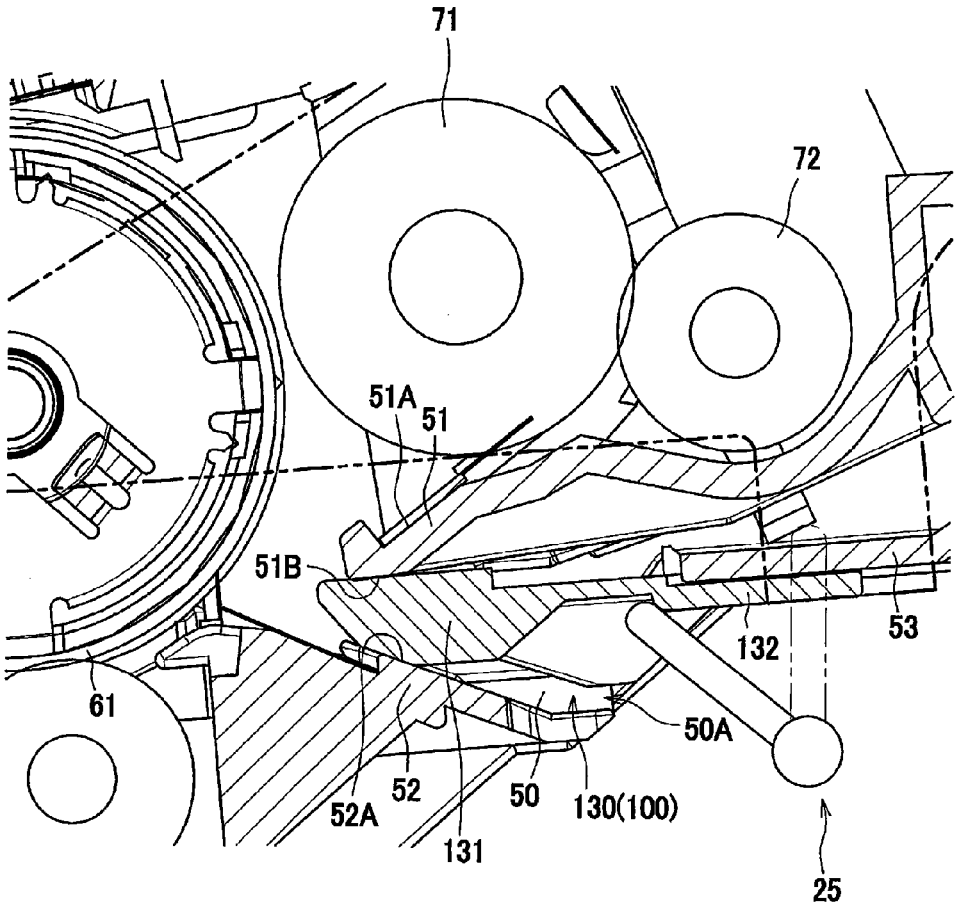


FIG.10A

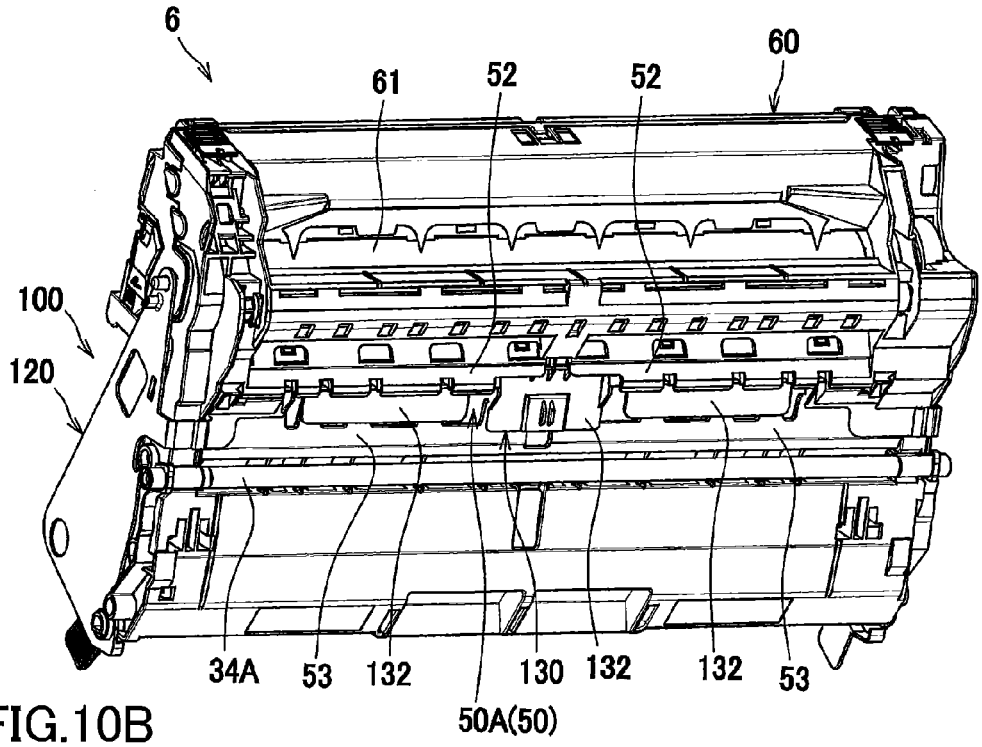


FIG.10B

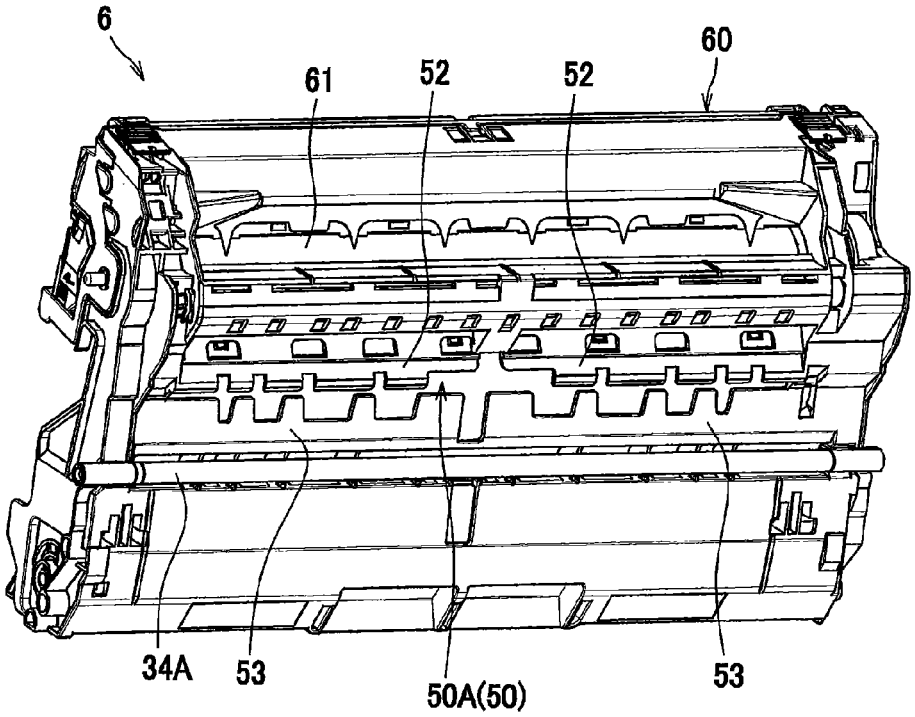
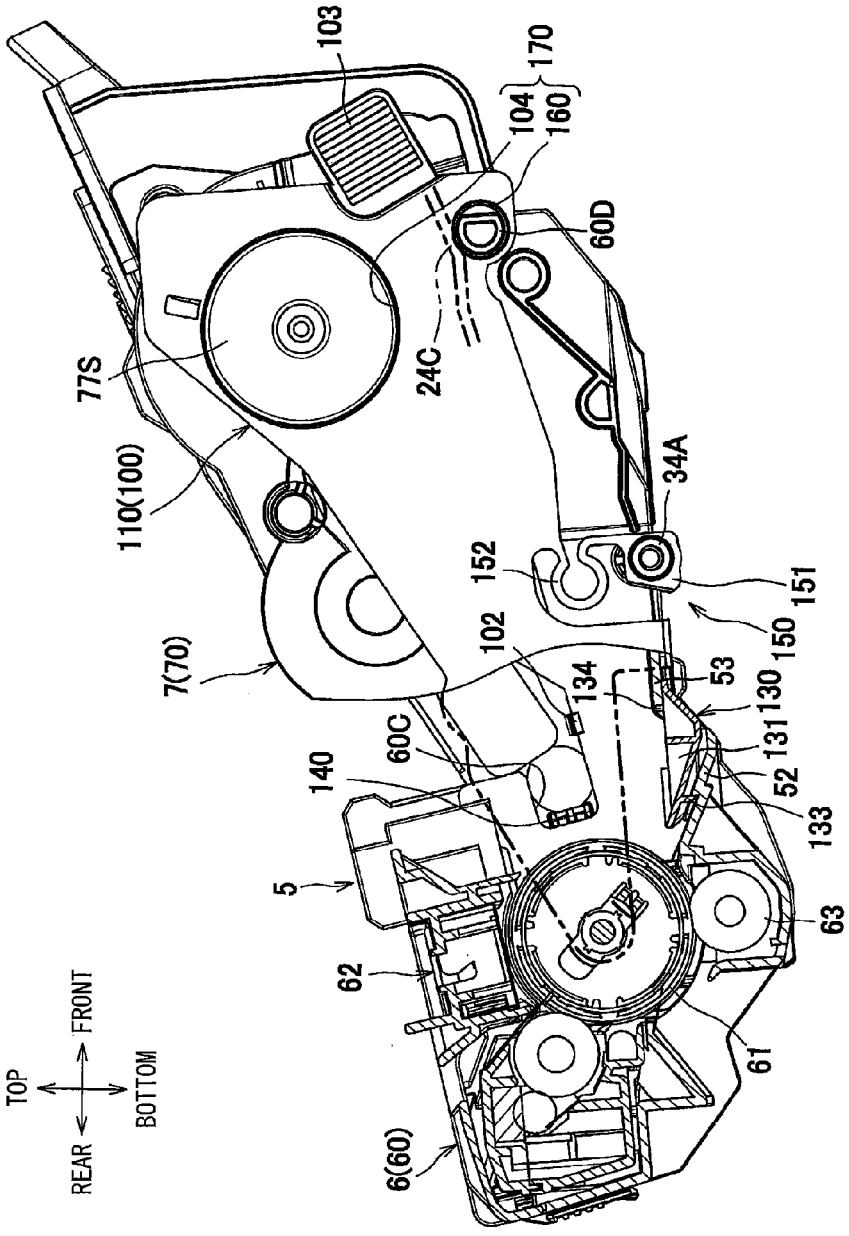


FIG. 11


103
170
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60D
24C
77S
110(100)
34A
152
151
150
102
7(70)
53
134
130
131
60C
52
140
133
5
63
62
61
6(60)
TOP
FRONT
REAR
BOTTOM

FIG.12A

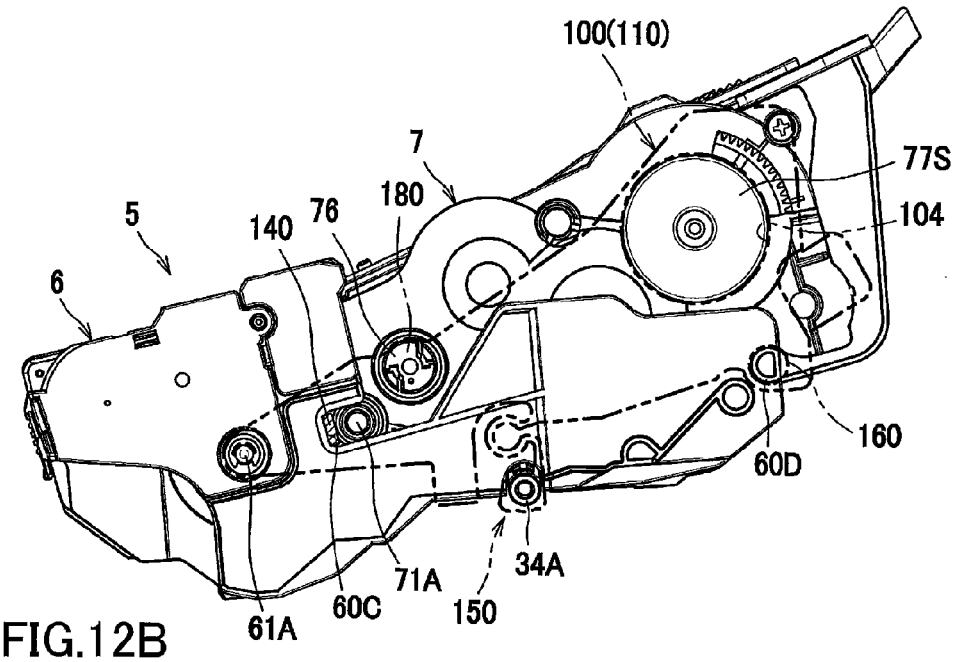

FIG.12B

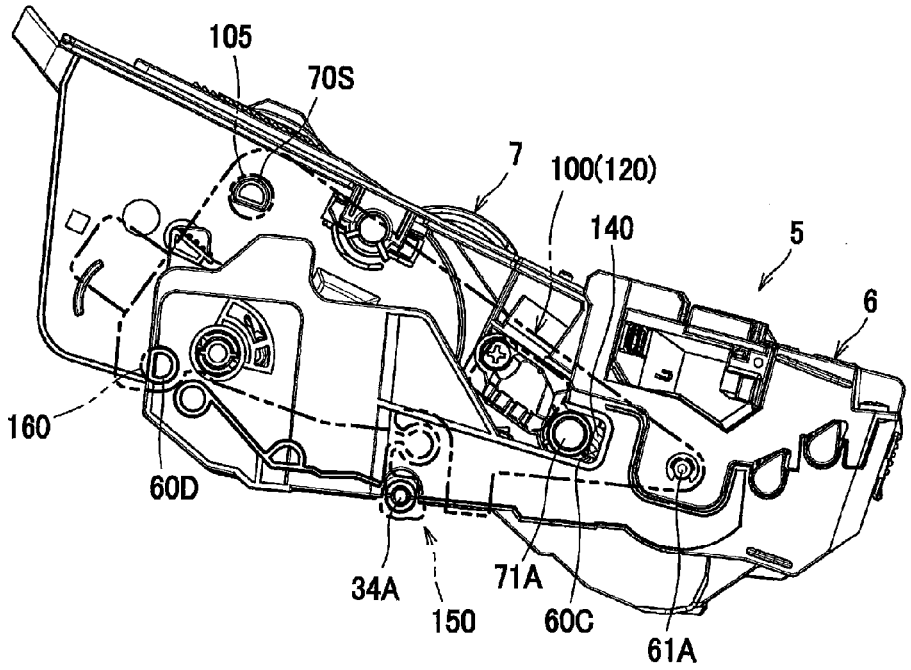

FIG.13A

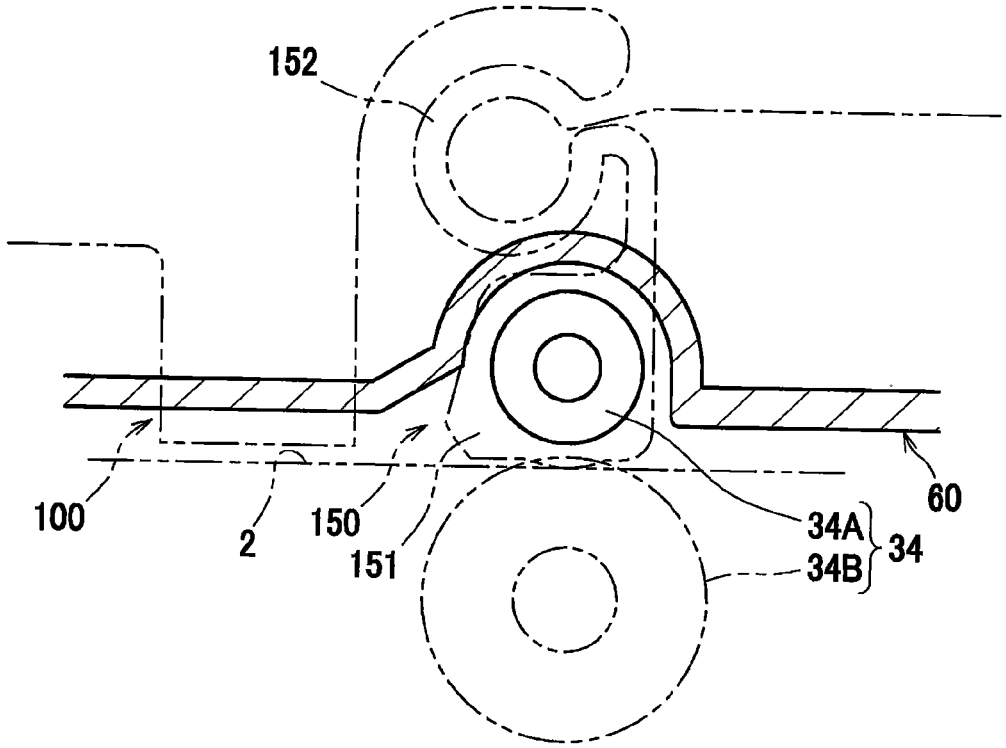

FIG.13B

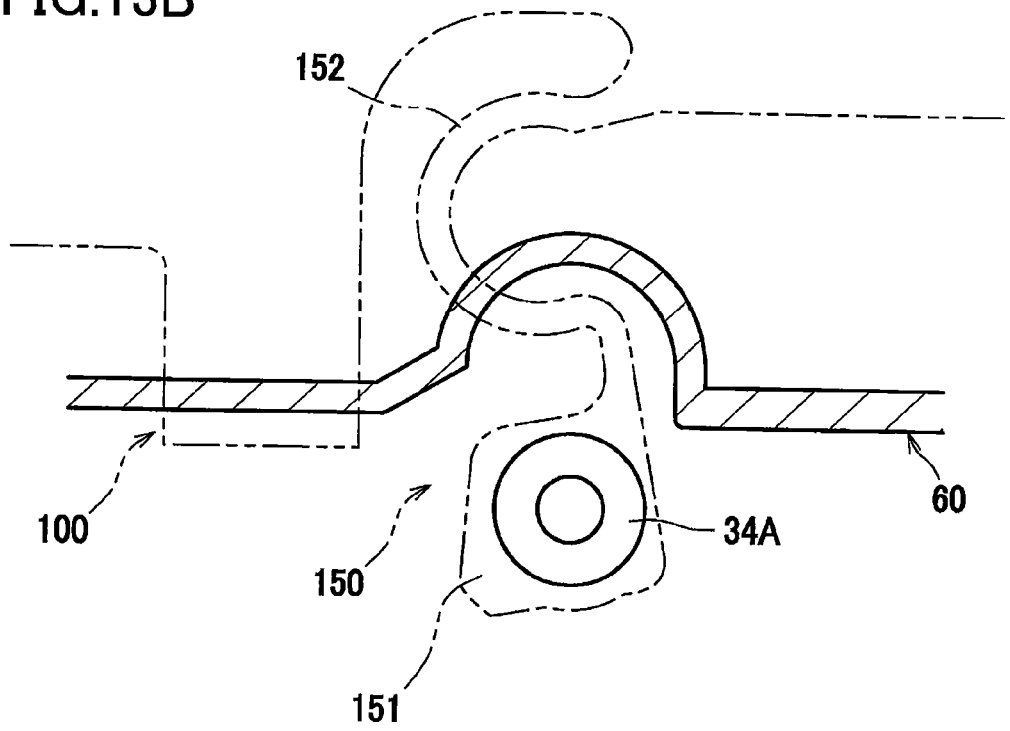

IMAGE FORMING APPARATUS PROVIDED WITH PROCESS CARTRIDGE

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority from Japanese Patent Application No. 2015-021726 filed Feb. 6, 2015. The entire content of this priority application is incorporated herein by reference.

TECHNICAL FIELD

The present disclosure relates to an image forming apparatus provided with a process cartridge attachable to and detachable from a housing of the apparatus.

BACKGROUND

An image forming apparatus is known in the art in which a process cartridge can be attached to and detached from a housing of the apparatus. Japanese Patent Application publication No. 2007-248618 discloses a process cartridge including a first frame supporting a photosensitive member, and a second frame movably supported to the first frame so that a developing roller is movable toward and away from the photosensitive member.

In terms of an image forming apparatus, the apparatus may be transported for shipping while the process cartridge is attached to the housing of the apparatus. The Japanese Patent Application Publication discloses a mechanism for separating the developing roller away from the photosensitive member so as to avoid plastic deformation of the developing roller during transportation.

SUMMARY

If shipping is made while the process cartridge is attached to the housing of the image forming apparatus, toner or developing agent may be leaked out of the process cartridge due to impact imparted thereon during transportation.

In view of the foregoing, it is an object of the disclosure to provide an image forming apparatus capable of restraining leakage of toner from the process cartridge.

In order to attain the above and other objects, the disclosure provides an image forming apparatus that includes a housing; a process cartridge; and a protective member. The process cartridge is detachably attached to the housing and includes a drum unit; and a developing unit. The drum unit includes a photosensitive member. The developing unit includes a developing roller; an accommodating portion; and a first wall. The accommodating portion is configured to accommodate developing agent. The developing roller defines a first axis extending in an axial direction and is configured to rotate about the first axis and supply the developing agent to the photosensitive member. The first wall has a first surface; and a second surface opposite thereto. The first surface extends in the axial direction and faces the developing roller. The protective member is detachably attached to the process cartridge and includes a spacer. The drum unit includes a second wall. The second wall has a third surface. The third surface extends in the axial direction and faces the second surface. The spacer is disposed between the second surface and the third surface.

BRIEF DESCRIPTION OF THE DRAWINGS

The particular features and advantages of the embodiment as well as other objects will become apparent from the following description taken in connection with the accompanying drawings, in which:

FIG. **1** is a schematic cross-sectional view of a laser printer as an example of an image forming apparatus according to one embodiment;

FIG. **2** is a perspective view of a drum unit and a developing unit in the laser printer according to the embodiment;

FIG. **3** is an enlarged cross-sectional view of the laser printer according to the embodiment;

FIG. **4** is an enlarged cross-sectional view of a housing of the laser printer according to the embodiment;

FIG. **5**A is a perspective view of the process cartridge as viewed from a left side;

FIG. **5**B is a perspective view of the process cartridge as viewed from a left side in which a protection assembly is attached to the cartridge;

FIG. **6**A is a perspective view of the process cartridge as viewed from a right side;

FIG. **6**B is a perspective view of the process cartridge as viewed from a right side in which the protection assembly is attached to the cartridge;

FIG. **7**A is a perspective view of the protection assembly as viewed from a left side;

FIG. **7**B is a perspective view of the protection assembly as viewed from a right side;

FIG. **8** is a cross-sectional view of the process cartridge to which the protection assembly is attached;

FIG. **9** is a partial enlarged cross-sectional view of the process cartridge to which the protection assembly is attached;

FIG. **10**A is a perspective view of the drum unit to which the protection assembly is attached as viewed from below;

FIG. **10**B is a perspective view of the drum unit as viewed from below;

FIG. **11** is a left side view partially cross-sectioned illustrating the process cartridge to which the protection assembly is attached;

FIG. **12**A is a left side view of the process cartridge to which the protection assembly is attached;

FIG. **12**B is a right side view of the process cartridge to which the protection assembly is attached;

FIG. **13**A is a view illustrating an uppermost position of a follow roller in the laser printer according to the embodiment; and

FIG. **13**B is a view illustrating a lowermost position of the follow roller in the laser printer according to the embodiment.

DETAILED DESCRIPTION

Next, an image forming apparatus according to one embodiment will be described with reference to drawings. In the following description, a laser printer **1** will be described as an example of the image forming apparatus. Throughout the specification, the terms "upward", "downward", "upper", "lower", "above", "below", "beneath", "right", "left", "front", "rear" and the like will be used assuming that the laser printer **1** is disposed in an orientation in which it is intended to be used. More specifically, in FIG. **1**, a right side and a left side are a front side and a rear side of the printer, respectively. Further, in FIG. **1**, a far side and a near side are a right side and a left side of the printer, respectively.

Further, in FIG. **1**, a top side and a bottom side are a top side and a bottom side of the printer, respectively.

As illustrated in FIG. **1**, the laser printer **1** includes a housing **2**. The laser printer **1** further includes, within the housing **2**, a sheet supply unit **3**, an exposure unit **4**, a process cartridge **5**, and the fixing unit **8**.

The housing **2** is provided with a front cover **21**. The front cover **21** covers an opening formed in the housing **2** at its closed position and exposes the opening at its open position. The sheet supply unit **3** is disposed in the housing at a bottom portion thereof. The sheet supply unit **3** includes a sheet supply tray **31** for accommodating sheets S, a lifter plate **32** for lifting up front edges of the sheets S, a sheet supplying mechanism **33**, and a pair of registration rollers **37**. The sheets S accommodated in the sheet supply tray **31** are directed upward by the lifter plate **32**, and are supplied toward the process cartridge **5** by the sheet supplying mechanism **33**. Each sheet S is conveyed to a position between a photosensitive drum **61** and a transfer roller **63** after passing through registration rollers **34**.

The exposure unit **4** is disposed in the housing **2** at a top portion thereof. The exposure unit **4** includes a laser emission unit, a polygon mirror, lenses, and reflection mirrors those not shown. In the exposure unit **4**, a laser beam (indicated by a two dotted chain line in FIG. **1**) based on image data is emitted from the laser emission unit, and the laser beam scans a surface of the photosensitive drum **61** at a high speed, so that the surface of the photosensitive drum **61** is exposed to light.

The process cartridge **5** is disposed below the exposure unit **4**. The process cartridge **5** is detachable from and attachable to the housing **2** through the opening formed in the housing **2**. The process cartridge **5** includes a drum unit **6** and a developing unit **7**.

The developing unit **7** includes a developing roller **71**, a supply roller **72**, a layer thickness regulation blade **73**, a toner-accommodating section **74** for accommodating toner as an example of developing agent therein, and an agitator **75**. The drum unit **6** is configured to allow the developing unit **7** to be attached to an detached from the drum unit **6**. The drum unit **6** includes the photosensitive drum **61** as an example of a photosensitive member, a charger **62**, and the transfer roller **63**.

In the process cartridge **5**, the surface of the photosensitive drum **61** is exposed to light by high speed scan of the laser beam emitted from the exposure unit **4** after the charger **62** applies a uniform charge to the surface of the photosensitive drum **61**. As a result, an electrostatic latent image based on the image data is formed on the photosensitive drum **61**. At this time, the toner accommodated in the toner-accommodating section **74** is agitated by the agitator **75**, and is supplied to the developing roller **71** through the supply roller **72**. The toner supplied to the developing roller **71** is carried on the developing roller **71** as a thin toner layer having a uniform thickness by the layer thickness regulation blade **73** in accordance with rotation of the developing roller **71**.

The toner carried on the developing roller **71** is supplied to the electrostatic latent image formed on the photosensitive drum **61**. As a result, a visible toner image corresponding to the electrostatic latent image is formed on the photosensitive drum **61**. Subsequently, the toner image formed on the photosensitive drum **61** is transferred onto the sheet S while the sheet S is conveyed between the photosensitive drum **61** and the transfer roller **63**.

The fixing unit **8** is disposed rearward of the process cartridge **5**. The fixing unit **8** includes a heat unit **81** and a pressure roller **82**. The heat unit **81** includes a halogen heater, a fixing belt, and a nip plate those not shown. The pressure roller **82** is adapted to nip the fixing belt between the nip plate and the pressure roller **82**. The toner image transferred onto the sheet S is thermally fixed thereon while the sheet S passes through a position between the heat unit **81** and the pressure roller **82**. The sheet S onto which the toner image has been thermally fixed is discharged on a discharge tray **22** by conveying rollers **23**.

As shown in FIG. **2**, in addition to the developing roller **71** and toner accommodating portion **74**, the developing unit **7** includes a development frame **70**, a coupling **76** as an example of the drive receiving unit, and a cover **77**.

As shown in FIG. **3**, the development frame **70** rotatably supports the developing roller **71**, the supply roller **72**, and the like and forms the toner accommodating portion **74** therein. The development frame **70** has a first wall **51**. The first wall **51** constitutes part of a bottom wall **70**B of the developing unit **7**, and specifically the rear portion of the bottom wall **70**B. In a cross-sectional view, the front portion of the bottom wall **70**B curves in a general arc shape whose convex side faces downward to from the bottom wall of the toner accommodating portion **74**. At the approximate front-rear center of the developing unit **7**, the bottom wall **70**B extends downward, and then the rear portion of the bottom wall **70**B extends rearward in a shape that conforms to the outer circumferences of the supply roller **72** and the developing roller **71**. The first wall **51** extends in the left-right direction (the axial direction of the developing roller **71**). The first wall **51** includes a top surface **51**A that confronts and faces the developing roller **71**, and a bottom surface **51**B on the opposite side from the top surface **51**A. The top surface **51**A is an example of the first surface, while the bottom surface **51**B is an example of the second surface. Toner supplied from the toner accommodating portion **74** is present in (enters) the space between the first wall **51** and the developing roller **71**.

A lower film **78** is disposed between the developing roller **71** and the first wall **51**. One end of the lower film **78** is fixed to the first wall **51**, while the other end is positioned so as to contact the developing roller **71** in order to prevent toner from leaking through the space between the developing roller **71** and the first wall **51**.

Contact parts **70**A are provided on the outer surfaces of the left and right side walls constituting the development frame **70** and protrude outward in corresponding left and right directions therefrom. As shown in FIG. **6**A, a protruding part **70**S is disposed on the outer surface of the right wall constituting the development frame **70** and protrudes rightward therefrom.

As shown in FIG. **2**, the coupling **76** is rotatably supported on the left wall of the development frame **70**. A drive force from the main casing **2** is inputted into the coupling **76**. The coupling **76** transmits the drive force to the developing roller **71**, the supply roller **72**, and the agitator **75** through a drive transmission mechanism (not shown), such as a plurality of gears, provided on the left surface of the development frame **70** for driving these components to rotate.

The cover **77** is mounted on the left wall of the development frame **70** and covers the coupling **76** and the drive transmission mechanism described above. A protruding part **77**S is provided on the outer surface of the cover **77** and protrudes leftward therefrom.

In addition to the photosensitive drum **61**, the charger **62**, and the transfer roller **63** described above, the drum unit **6**

includes a drum frame **60**, pressing members **64**, positioning rollers **65**, and a follow roller **34**A as an example of the second roller.

The drum frame **60** functions to rotatably support the photosensitive drum **61**, the follow roller **34**A, and the like, as well as to form a mounting section **60**A in which the developing unit **7** is detachably mounted. An engaging recess **60**C is formed in each of the left and right side walls constituting the drum frame **60**. The engaging recesses **60**C are open on the front side. Rotational shafts **71**A of the developing roller **71** engage in the corresponding engaging recesses **60**C when the developing unit **7** is mounted in the drum unit **6**. A boss **60**D is provided on each of the left and right side walls of the drum frame **60**. The bosses **60**D protrude outward in respective left and right directions.

As shown in FIG. **3**, the drum frame **60** has a second wall **52** and a third wall **53** configuring the bottom wall of the drum unit **6**. The second wall **52** is positioned beneath the first wall **51** when the developing unit **7** is mounted in the drum unit **6** and is separated a prescribed distance from the first wall **51**. The second wall **52** has a top surface **52**A that confronts and faces the bottom surface **51**B of the first wall **51**. The top surface **52**A is an example of the third surface. The third wall **53** is positioned entirely forward of the second wall **52** and oppose nearly the entire bottom wall **70**B of the developing unit **7**, excluding the first wall **51**. The third wall **53** is also arranged higher than the rear edge of the second wall **52** and extends in the general front-rear direction.

The first wall **51** and second wall **52** form the walls of a path **50** that functions to guide sheets S from outside the process cartridge **5** toward the photosensitive drum **61**, and more specifically toward the point between the photosensitive drum **61** and the transfer roller **63**. Further, the rear edge of the second wall **52** and the front edge of the third wall **53** from an opening **50**A that serves as the entrance to the path **50**.

When the developing unit **7** is mounted in the drum unit **6**, the pressing members **64** press the contact parts **70**A of the developing unit **7** rearward in order to urge the developing roller **71** toward the photosensitive drum **61**. Each of the pressing members **64** primarily includes a pressing arm **64**A, and a coil spring **64**B. The pressing arms **64**A are supported on the drum frame **60** so as to be capable of pivoting forward and rearward. The coil springs **64**B are disposed between the corresponding pressing arms **64**A and the drum frame **60**.

When the developing unit **7** is mounted in the drum unit **6**, the contact parts **70**A contact the corresponding pressing arms **64**A and force the pressing arms **64**A to pivot forward. When pressing arms **64**A pivot forward, the coil springs **64**B are compressed. Thus, the restoring force of the coil springs **64**B causes the pressing arms **64**A to press the contact parts **70**A rearward. Consequently, the entire developing unit **7** is urged rearward in order to press the developing roller **71** against the photosensitive drum **61**. In the embodiment, the developing roller **71** is configured to supply toner to the photosensitive drum **61** while contacting the same.

The positioning rollers **65** are disposed on the front edge of the drum frame **60**, with one on each of the left and right sides. The positioning rollers **65** are rotatably supported on the drum frame **60** about shafts aligned in the left-right direction. When the developing unit **7** is mounted in the drum unit **6**, the developing unit **7** contacts the tops of the positioning rollers **65**, thereby enabling the developing unit **7** to be positioned relative to the drum unit **6**. Further, the positioning rollers **65** rotate when the developing unit **7** is mounted in and removed from the drum unit **6**, facilitating the mounting and removing operations.

The follow roller **34**A and a drive roller **34**B provided in the main casing **2** as an example of the first roller constitute the registration rollers **34**. The follow roller **34**A is rotatably supported in the drum frame **60**. When the process cartridge **5** is mounted in the main casing **2**, the follow roller **34**A is positioned above the drive roller **34**B. The registration rollers **34** are arranged on the upstream side of the photosensitive drum **61** in the conveying direction of the sheets S, i.e., forward of the photosensitive drum **61**. When the drive roller **34**B is driven to rotate, the follow roller **34**A follows the rotation, and together the registration rollers **34** convey sheets S to a position between the photosensitive drum **61** and the transfer roller **63**.

The follow roller **34**A is supported in the drum frame **60** with play in the vertical direction. That is, the follow roller **34**A can move vertically between an uppermost position (see FIG. **13**A) as an example of the first position, and a lowermost position (see FIG. **13**B) as an example of the second position. When the process cartridge **5** is mounted in the main casing **2**, the follow roller **34**A contacts the drive roller **34**B with pressure due to springs (not shown) provided in the main casing **2** that urge the follow roller **34**A toward the drive roller **34**B.

As shown in FIG. **4**, the main casing **2** includes a mounting section **2**A, a pair of left and right guides **24** (only one is shown in FIG. **4**), a sensor **25** as an example of the sensing member, a malfunction reporting unit **26**, and a drive input member **27**.

The mounting section **2**A is the region of the main casing **2** in which the process cartridge **5** is mounted. The mounting section **2**A is revealed when the front cover **21** is opened.

The left and right guides **24** are structured to guide the process cartridge **5** to a mounted position indicated by a double chain line in FIG. **4**. Each guide **24** primarily includes a pair of drum guides **24**A for guiding a drum shaft **61**A of the photosensitive drum **61** and a boss guide **24**B for guiding the corresponding boss **60**D on the drum frame **60** when the process cartridge **5** is mounted in the main casing **2**. The boss guide **24**B has a boss contact part **24**C that contacts the boss **60**D when the process cartridge **5** is mounted in the main casing **2**.

The sensor **25** detects the presence of a sheet S being conveyed in the main casing **2**. The sensor **25** is disposed along the conveying path of the sheet S between the registration rollers **34** and the photosensitive drum **61**, i.e., to the rear of the registration rollers **34**. The sensor **25** primarily includes an actuator **25**A that pivots when contacted by a sheet S, and a photosensor (not shown) that detects when the actuator **25**A pivots. The actuator **25**A is supported so as to be capable of pivoting between a non-detection position depicted by a solid line in FIG. **4**, and a detection position depicted by a chain line. The actuator **25**A pivots from the non-detection position to the detection position when contacted by a sheet S, and is returned from the detection position to the non-detection position by the urging force of a spring (not shown) after the sheet S passes over the actuator **25**A.

The malfunction reporting unit **26** functions to report malfunction to the user. In the embodiment, the malfunction reporting unit **26** notifies the user that a paper jam has occurred when a sheet S becomes jammed in the laser printer **1**. More specifically, the malfunction reporting unit **26** determines that a sheet S has become jammed in the laser printer **1** and notifies the user of this paper jam when the sensor **25** continuously detects the presence of a sheet S for

more than a predetermined time, i.e., when the actuator **25**A is in the detection position for at least the prescribed time. Here, the malfunction reporting unit **26** notifies the user by displaying an error message on a liquid crystal display provided on the main casing **2**, by playing a warning sound from a speaker, and the like.

As shown in FIG. **5**A, the drive input member **27** functions to input a drive force from a motor (not shown) provided in the main casing **2** to the coupling **76** of the process cartridge **5**. The drive input member **27** is provided in the left wall of the main casing **2** and is configured to advance and retract in the left-right direction according to a mechanism known in the art. Specifically, the drive input member **27** advances inward (rightward) in association with an operation to close the front cover **21**, and retracts outward (leftward) in association with an operation to open the front cover **21**. When advanced inward, the drive input member **27** engages with the coupling **76** of the process cartridge **5** mounted in the main casing **2** and can input a drive force into the coupling **76**. When retracted outward, the drive input member **27** disengages from the coupling **76**.

In the embodiment, the drive input member **27** is elastically advanced and retracted in the left-right direction by the action of a spring **27**B. With this configuration, even though a force relative to the outward (leftward) direction acts on the drive input member **27** when the drive input member **27** advances inward (rightward), the spring **27**B compresses to reduce the force applied to the drive input member **27**.

In the embodiment, the laser printer **1** is shipped from the factory with the process cartridge **5** mounted in the main casing **2**. At this time, a detachable protection assembly **100** is attached to the process cartridge **5** as shown in FIGS. **5**B and **6**B. The protection assembly **100** is an example of the protective member.

As shown in FIGS. **7**A and **7**B, the protection assembly **100** is a single, integrated member. The protection assembly **100** may be formed of polypropylene resin, for example. The protection assembly **100** has a left portion **110** that attaches to the left side of the process cartridge **5**, a right portion **120** that attaches to the right side of the process cartridge **5**, and a spacer **130** that attaches to the bottom of the process cartridge **5**.

Each of the left and right portions **110** and **120** has a drum engaging hole **101**, an anchoring pawl **102**, and a grip **103**. A first-protrusion engaging part **104** is formed in the left portion **110**, while a second-protrusion engaging part **105** is provided on the right portion **120**.

The drum engaging holes **101** are holes that penetrate the left and right portions **110** and **120** for engaging with the drum shaft **61**A of the photosensitive drum **61**. The drum engaging holes **101** are formed in the rear ends of the left and right portions **110** and **120**.

The anchoring pawls **102** are anchored on the drum frame **60** and development frame **70** when the protection assembly **100** is attached to the process cartridge **5**. By anchoring the anchoring pawls **102** on the drum frame **60** and development frame **70**, the protection assembly **100** does not easily come off the process cartridge **5** due to vibrations and the like during transport.

The grips **103** are the parts of the left and right portions **110** and **120** that are operated when the protection assembly **100** is attached to and detached from the process cartridge **5**. The grips **103** are disposed on the front edges of the left and right portions **110** and **120**.

The first-protrusion engaging part **104** is provided in the top front corner of the left portion **110**. The first-protrusion engaging part **104** engages with the protruding part **77**S formed on the left wall of the developing unit **7** when the protruding part **77**S is inserted through the first-protrusion engaging part **104**.

The second-protrusion engaging part **105** is provided on the top front corner of the right portion **120**. The second-protrusion engaging part **105** engages with the protruding part **70**S formed on the right side of the developing unit **7** when the protruding part **70**S is inserted in the second-protrusion engaging part **105**.

In addition to the spacer **130**, the features of the protection assembly **100** related to the present disclosure are first separating parts **140**, second separating parts **150**, boss engaging parts **160**, retaining parts **170**, and a covering part **180**. In the following description, the protection assembly **100** will be said to be in an attached state when mounted on the process cartridge **5**, and in a detached state when not mounted on the process cartridge **5**.

The spacer **130** extends in the left-right direction and bridges the bottom edges of the left and right portions **110** and **120** near the rear ends thereof. The spacer **130** primarily includes a spacer body **131**, exposed parts **132**, and retaining parts **133** and **134**.

As shown in FIG. **8**, the spacer body **131** has a general wedge shape that grows narrower toward the rear edge (the downstream side in the direction of insertion) when viewed along the left-right direction. The spacer **130** is mounted on the process cartridge **5** by inserting the wedge-shaped spacer body rearward through the opening **50**A formed in the path **50** and between the first wall **61** and the second wall **52**. As shown in FIG. **9**, the spacer body **131** is disposed between the bottom surface **51**B of the first wall **51** and the top surface **52**A of the second wall **52** when the protection assembly **100** is in the attached state. More specifically, the spacer body **131** is in contact with both the bottom surface **51**B of the first wall **51** and the top surface **52**A of the second wall **52** when the protection assembly **100** is in the attached state. Thus, the first wall **51** and the second wall **52** hold the spacer **130** with the spacer body **131** interposed therebetween.

As shown in FIG. **7**, the exposed parts **132** extend forward from the front edge of the spacer body **131**. Three exposed parts **132** juxtaposed in the left-right direction are provided in the embodiment. As shown in FIG. **10**A, the exposed parts **132** pass through the opening **50**A and protrude from the path **50** (from between the first wall **51** and the second wall **52**) so as to be exposed on the bottom of the drum unit **6** when the protection assembly **100** is in the attached state. The exposed parts **132** can be made more visible by forming the protection assembly **100** and the drum frame **60** (process cartridge **5**) in different colors. FIG. **10**B is a perspective view from the bottom of drum unit **6** when the protection assembly **100** is in the detached state for comparison purposes with FIG. **10**A.

As shown in FIGS. **7**A and **7**B, the retaining parts **133** and **134** protrude from the spacer body **131** in a general vertical direction (a direction that intersects the insertion direction of the spacer **130**). One each of the retaining parts **133** and **134** is provided on both the left and right sides of the spacer body **131**. The retaining parts **133** protrude downward from the spacer body **131**, while the retaining parts **134** protrude upward from the spacer body **131** at positions both inward in the left-right direction and rearward of the respective retaining parts **133**. As shown in FIG. **11**, the retaining parts **133** engage in stepped parts (not provided with reference numerals in FIG. **11**) formed in the second wall **52** of the drum unit **6**, and the retaining parts **134** engage in the rear

end of the third wall **53** constituting the drum unit **6** when the protection assembly **100** is in the attached state.

The first separating parts **140** shown in FIG. **7** function to maintain the photosensitive drum **61** and the developing roller **71** in a separated state. The first separating parts **140** are formed as protrusions that protrude inward in the left-right direction. As shown in FIGS. **12**A and **12**B, the first separating parts **140** are engaged between the rotational shafts **71**A of the developing roller **71** and the rear parts of the engaging recesses **60**C, the developing roller **71** can be separated from the photosensitive drum **61**.

As shown in FIG. **11**, the second separating parts **150** maintain the follow roller **34**A in a position separated from the drive roller **34**B. Each second separating part **150** has a roller engaging part **151** in which the corresponding end of the follow roller **34**A is inserted and engaged, and an elastic part **152** that connects the respective roller engaging part **151** to the corresponding left and right portion **110** or **120**. The second separating parts **150** support the follow roller **34**A so that the follow roller **34**A can move vertically between a topmost position and a bottommost position. When the elastic parts **152** are deformed very little, the second separating parts **150** maintain the follow roller **34**A in a center position between the topmost and bottommost positions. The center position (the position in FIG. **11**) is an example of the third position. In the embodiment, the topmost position shown in FIG. **13**A is the position of the follow roller **34**A when the process cartridge **5** is mounted in the main casing **2** while the protection assembly **100** is in the attached state. At this time, the bottom edges of the roller engaging parts **151** contact parts of the main casing **2**, enabling the second separating part **150** to maintain the follow roller **34**A in a position separated from the drive roller **34**B.

As shown in the side view of FIG. **11**, the elastic parts **152** extend first rearward from the corresponding left and right portions **110** and **120** above the corresponding roller engaging parts **151**, curve to form a general C-shape, and then extend downward from the bottom end of the curved portion to connect to the corresponding roller engaging parts **151**. As shown in FIG. **13**A, the elastic parts **152** elastically deform when a force pushes the follow roller **34**A upward, causing the opening in the C-shaped section of the elastic part **152** to close and the gaps between the elastic parts **152** and the left and right portions **110** and **120** as well as between the elastic parts **152** and the corresponding roller engaging parts **151** to decrease. As shown in FIG. **13**B, the elastic parts **152** also elastically deform when a force pushes the follow roller **34**A downward, causing primarily the opening in the C-shaped section to expand. Being provided with these elastic parts **152** that are capable of elastically deforming, the second separating parts **150** can hold the follow roller **34**A such that the follow roller **34**A can elastically move upward and downward (the moving directions of the follow roller **34**A) from its center position shown in FIG. **11**.

The boss engaging parts **160** are cylindrical parts that fit around and engage the corresponding bosses **60**D formed on the process cartridge **5**. The boss engaging parts **160** protrude outward from the corresponding left and right portions **110** and **120** in the corresponding left and right directions. When engaged with the bosses **60**D, the boss engaging parts **160** are arranged between the bosses **60**D and the boss contact parts **24**C provided in the main casing **2**.

The retaining parts **170** are parts that maintain the developing unit **7** in a state of contact with the positioning rollers **65**. The retaining parts **170** are configured of the first-protrusion engaging part **104** and the second-protrusion engaging part **105** (see FIG. **7**) and the left and right boss engaging parts **160**. As shown in FIG. **12**A, the first-protrusion engaging part **104** and the boss engaging part **160** of the left portion **110** are arranged such that, when viewed in the left-right direction, the shortest distance from the protruding part **77**S to the boss **60**D when the protection assembly **100** is in the attached state is approximately the same as the shortest distance when the developing unit **7** contacts the positioning rollers **65** and the protection assembly **100** is in the detached state. As shown in FIG. **12**B, the second-protrusion engaging part **105** and the boss engaging part **160** of the right portion **120** are arranged such that, when viewed in the left-right direction, the shortest distance from the protruding part **70**S to the boss **60**D when the protection assembly **100** is in the attached state is approximately the same as the shortest distance when the developing unit **7** contacts the positioning rollers **65** when the protection assembly **100** is in the detached state. With this configuration, the developing unit **7** is brought into contact with the positioning rollers **65** when the protection assembly **100** is in the attached state, as shown in FIG. **8**.

As shown in FIG. **5**B, the covering part **180** constitutes part of the left portion **110**, and is the portion that confronts and faces the coupling **76** from the outer (left) side when the protection assembly **100** is in the attached state. Thus, when the protection assembly **100** is attached, the covering part **180** is positioned between the coupling **76** and the drive input member **27** so as to cover the coupling **76** from the outer (left) side thereof.

As shown in FIG. **8**, the sensor **25** provided in the main casing **2** in the embodiment detects the presence of the spacer **130** constituting the protection assembly **100** when the process cartridge **5** is mounted in the main casing **2**. Specifically, when the process cartridge **5** is mounted in the main casing **2** with the protection assembly **100** attached, the actuator **25**A of the sensor **25** is contacted by the center exposed part **132** of the spacer **130** and pivots from the non-detection position depicted by a chain line in FIG. **8** to the detection position depicted by a solid line.

By providing the sensor **25** to detect the presence of the spacer **130**, the malfunction reporting unit **26** can notify the user of a malfunction just as when a sheet S becomes jammed in the laser printer **1**, since the sensor **25** will detect the presence of the spacer **130** continuously. Note that the configuration of the embodiment cannot distinguish between a case in which a sheet S contacts the sensor **25** and a case in which the spacer **130** contacts the sensor **25**. Thus, if the presence of the spacer **130** is detected continuously, the malfunction reporting unit **26** determines that a sheet S has become jammed and reports this as a paper jam error.

To attach the protection assembly **100** to the process cartridge **5**, the left and right portions **110** and **120** are opened slightly outward in corresponding left and right directions from the state shown in FIG. **7** so that the gap between the left and right portions **110** and **120** is enlarged. In this state, the spacer body **131** of the spacer **130** is inserted through the opening **50**A formed in the process cartridge **5** into the path **50**, as depicted in FIG. **8**.

In this way, the spacer body **131** of the spacer **130** is positioned between the first wall **51** and the second wall **52**. At this time, the retaining parts **133** engage with the stepped parts formed on the second wall **52** and the retaining parts **134** engage with the rear edge of the third wall **53**. Accordingly, these engagements suppress the spacer **130** from being easily pulled out from between the first wall **51** and the second wall **52**.

Further, since the first wall **51** and the second wall **52** constitute walls that form the path **50** through which the sheet S passes in the embodiment, the spacer **130** can be attached to the process cartridge **5** by being inserted through the opening **50**A that serves as the entrance to the path **50**. Further, in a configuration such as that of the embodiment in which the drum unit **6** and the developing unit **7** are detachably assembled, the spacer **130** can be attached while the drum unit **6** and the developing unit **7** are assembled together by inserting the spacer **130** through the opening **50**A.

Further, since the spacer body **131** of the spacer **130** is formed in a wedge shape that tapers toward the rear edge when viewed along the left-right direction, the spacer **130** can be easily inserted between the first wall **51** and the second wall **52**.

Next, the left and right portions **110** and **120** are brought inward in the left-right direction. As shown in FIGS. **5** and **6**, the drum engaging holes **101** are engaged with ends of the drum shaft **61**A, the first-protrusion engaging part **104** with the protruding part **77**S, the second-protrusion engaging part **105** with the protruding part **70**S, the first separating parts **140** between the corresponding rotational shafts **71**A and the rear parts of the engaging recesses **60**C, the second separating parts **150** with the ends of the follow roller **34**A, and the boss engaging parts **160** with the bosses **60**D.

In this way, the protection assembly **100** is attached to the process cartridge **5**. In the attached state, the developing roller **71** is separated from the photosensitive drum **61** and the follow roller **34**A is held in its center position, as illustrated in FIG. **8**. Further, the outer circumferences of the bosses **60**D are covered by the boss engaging parts **160**, and the developing unit **7** is in contact with the positioning rollers **65**. The coupling **76** is also covered by the covering part **180** (see FIG. **5**).

Once the protection assembly **100** is attached to the process cartridge **5**, the process cartridge **5** is then mounted in the main casing **2**. Since the second separating parts **150** maintain the follow roller **34**A in the center position between the uppermost position shown in FIG. **13**A and the lower most position shown in FIG. **13**B, even if the follow roller **34**A contacts a part in the main casing **2** and moves vertically when the process cartridge **5** is being mounted in the main casing **2**, the follow roller **34**A moves only up or down from the center position. Therefore, this configuration can reduce the amount of movement in the follow roller **34**A compared to a structure in which the follow roller **34**A can move from the uppermost position to the lowermost position, thereby reducing the amount of deformation in the protection assembly **100** in the vicinity of the second separating parts **150** that supports the follow roller **34**A. Thus, this construction can reduce the load on the protection assembly **100**.

A particular feature of the embodiment is that the load on the protection assembly **100** can be reduced since the second separating parts **150** can elastically hold the follow roller **34**A so that the follow roller **34**A is allowed to move. Reducing the load on the protection assembly **100** can increase the life of the protection assembly **100**, making it possible to recover and reuse both the protection assembly **100** and the used process cartridge **5**, for example.

When the process cartridge **5** is mounted in the main casing **2** with the protection assembly **100** attached, the boss engaging parts **160** are arranged between the corresponding bosses **60**D and the boss contact parts **24**C and the follow roller **34**A is positioned apart from the drive roller **34**B, as shown in FIG. **11**. When the front cover **21** is subsequently closed, the drive input member **27** advances inward in order to engage with the coupling **76** but is prevented from doing so due to contact with the covering part **180**, as illustrated in FIG. **5**B. However, the compressed spring **27**B suppresses a large force from begin applied to the covering part **180** or the drive input member **27** itself.

Subsequently, the laser printer **1** and the process cartridge **5** with the attached protection assembly **100** mounted in the laser printer **1** are packaged in a box or the like and shipped, i.e., transported to their destination. Since the spacer **130** is interposed between the first wall **51** and the second wall **52** in the embodiment, as shown in FIG. **8**, the spacer **130** can suppress deformation in the first wall **51** when the process cartridge **5** incurs any impacts and the like during transport. Consequently, the protection assembly **100** can suppress toner leakage through the space between the developing roller **71** and the first wall **51**, thereby suppressing toner leakage from the process cartridge **5** during transport.

Further, since the follow roller **34**A is separated from the drive roller **34**B, the protection assembly **100** can suppress deformation in the surfaces of the drive roller **34**B and the follow roller **34**A, which may occur when the drive roller **34**B and the follow roller **34**A are in constant contact during transport.

Since the developing unit **7** is in contact with the positioning rollers **65**, the positioning rollers **65** can stabilize the position of the developing unit **7**, which possesses the toner-accommodating section **74**. Accordingly, this arrangement can suppress rattling of the developing unit **7** during transport, thereby better suppressing toner leakage from the process cartridge **5**.

By using the positioning rollers **65** as members for fixing the position of the developing unit **7**, the developing unit **7** and the drum unit **6** (positioning rollers **65**) are less likely to wear than in a structure in which the developing unit contacts positioning parts that are fixed to the drum unit.

Since the circumferential walls of the boss engaging parts **160** are arranged between the corresponding bosses **60**D and the boss contact parts **24**C, as illustrated in FIG. **11**, the process cartridge **5** can be restrained from rattling in the main casing **2** during transport. Further, by disposing the boss engaging parts **160** between the corresponding bosses **60**D and the boss contact parts **24**C, it is possible to reduce wear in the bosses **60**D and boss contact parts **24**C during transport.

If the user forgets to remove the protection assembly **100** prior to using the laser printer **1**, the sensor **25** will detect the presence of the spacer **130** as illustrated in FIG. **8**, and the malfunction reporting unit **26** will notify the user of the malfunction (paper jam). Consequently, the user can be reminded to remove the protection assembly **100**.

By using the sensor **25** to detect sheets S as well as to detect the spacer **130**, the number of required parts for the laser printer **1** in the embodiment can be reduced. From another perspective, the protection assembly **100** can be retroactively applied to the process cartridge **5** used in a laser printer **1** that was originally equipped with the sensor **25**.

Since the drive input member **27** is blocked by the covering part **180** and not able to engage with the coupling **76** when the protection assembly **100** is attached to the process cartridge **5**, the developing roller **71**, the agitator **75**, and the like cannot be driven to rotate, even if the user attempts to operate the laser printer **1** without first removing the protection assembly **100**. Thus, this construction prevents the process cartridge **5** from being needlessly driven and, hence, suppresses needlessly added stress to the toner by agitation from the rotating agitator **75**.

When notified of a malfunction (paper jam), the user removes the process cartridge **5** from the main casing **2** in order to remove the jammed sheet S. Since the exposed parts **132** are visible on the outside of the process cartridge **5**, the user can easily notice at this time that the protection assembly **100** was not removed.

Since the protection assembly **100** integrally possesses the spacer **130**, the first separating parts **140**, the second separating parts **150**, the covering part **180**, and the like, all of the above parts can be removed at the same time by simply removing the protection assembly **100**. This arrangement prevents the user from forgetting to remove one of the spacer **130**, the first separating parts **140**, and the like, unlike a structure in which these members are provided individually.

While the description has been made in detail with reference to specific embodiment thereof, it would be apparent to those skilled in the art that many modifications and variations may be made therein without departing from the spirit of the above-described embodiment, the scope of which is defined by the attached claims.

The structure of the spacer **130** described in the above-described embodiment is merely an example, and the present disclosure is not limited to this structure. For example, if the protection assembly possesses both left and right portions **110** and **120**, as described in the above-described embodiment, the spacer may be configured without the exposed parts and retaining parts. Further, when viewed along the axial direction of the developing roller, the spacer need not have a wedge shape, provided that the spacer can be inserted between the first wall and the second wall.

The structures of the first separating parts **140** and the second separating parts **150** described in the above-described embodiment are also merely examples, and the present disclosure is not limited to these structures. For example, the first separating parts may be configured as spacers that are disposed between the photosensitive body and the developing roller in order to separate them from each other. The second separating parts may similarly be configured as spacers.

The covering part **180** in the above-described embodiment is configured to cover nearly the entire coupling **76** (drive input unit), but the present disclosure is not limited to this configuration. That is, the covering part may be configured to cover at least part of the drive input unit, provided that the covering part prevents the drive input unit from engaging with a drive input member in the device body.

The protection assembly **100** is formed as a single integrated member in the above-described embodiment, but the protection assembly of the present disclosure may be configured of a plurality of separate parts. For example, the spacer **130** shown in FIG. **7** may be configured as a separate member from the left and right portions **110** and **120**. Further, when the protection assembly is configured of a plurality of parts, components for suppressing rattling, such as the boss engaging parts **160** described in the above-described embodiment, may be formed of parts (materials) having elasticity.

In the above-described embodiment, the follow roller **34**A (second roller) and bosses **60**D are provided with the drum unit **6**, and the coupling **76** (drive input unit) is provided on the developing unit **7**, but the present disclosure is not limited to this arrangement. For example, the drive input unit may be provided on the drum unit or may be provided on both the drum unit and the developing unit. The same can be said for the second roller and the bosses.

While the developing unit **7** is detachably mounted in the drum unit **6** in the above-described embodiment, the present disclosure is not limited to this configuration. For example, the developing unit may be configured to be non-detachable from the drum unit, but instead may be pivotably (displaceably) supported on the drum unit so that the developing roller can be separated from and brought into contact with the photosensitive body. Alternatively, the developing unit and drum unit may be integrally formed or otherwise configured to not move relative to each other.

While the sensing member of the above-described embodiment is configured using the sensor **25** for detecting the presence of sheets S, the present disclosure is not limited to this configuration. For example, the sensing member may be a dedicated sensor for detecting the presence of the spacer. By providing this dedicated sensor for detecting the presence of the spacer, the image forming apparatus can report that the protection assembly has not been removed as the malfunction when the sensor detects the presence of the space instead of reporting a paper jam.

In the above-described embodiment, the monochromatic laser printer **1** is exemplified as the image forming apparatus, but the present disclosure is not limited to this configuration. For example, a color printer is available as the image forming apparatus. Further, instead of the printer, a copying machine and a multi-function device provided with an original reading device such as a flat-bed scanner are also available.

In the above-described embodiment, the photosensitive drum **61** is exemplified as the photosensitive member, but the present disclosure is not limited to this configuration. For example, a photosensitive belt is also available instead of the photosensitive drum **61**.

In the above-described embodiment, the sheet S, such as a plain paper, a postcard, and the like, is exemplified as the image recording sheet, but the present disclosure is not limited to this configuration. For example, an OHP sheet is also available instead of the sheet S.

What is claimed is:

1. An image forming apparatus comprising:

a housing;

a process cartridge detachably attached to the housing, the process cartridge comprising:

a drum unit including a photosensitive member; and

a developing unit including a developing roller, an accommodating portion configured to accommodate developing agent, and a first wall, the developing roller defining a first axis extending in an axial direction and being configured to rotate about the first axis and supply the developing agent to the photosensitive member, the first wall having a first surface and a second surface opposite thereto, the first surface extending in the axial direction and facing the developing roller;

a protective member detachably attached to the process cartridge and including a spacer, the drum unit including a second wall having a third surface extending in the axial direction and facing the second surface, the spacer being disposed between the second surface and the third surface;

a sensing member configured to detect presence of the spacer when the process cartridge is attached to the housing;

a malfunction reporting unit configured to report malfunction when the sensing member detects the presence of the spacer; and

a registration roller configured to convey an image recording sheet to the photosensitive member in a conveying direction, the sensing member being further configured

to detect presence of the image recording sheet being conveyed between the registration roller and the photosensitive member.

2. The image forming apparatus according to claim **1**, wherein the spacer has an exposed part protruding from between the first wall and the second wall so as to be visible from an outside of the process cartridge.

3. The image forming apparatus according to claim **1**, wherein

the protective member further includes a first separating part configured to maintain the developing roller in a position separated from the photosensitive member; and

wherein the developing roller is configured to supply the developing agent to the photosensitive member when the developing roller contacts the photosensitive member.

4. The image forming apparatus according to claim **1**, further comprising a first roller,

wherein the process cartridge further comprises a second roller to convey an image recording sheet in cooperation with the first roller; and

wherein the protective member further includes a second separating part configured to maintain the second roller in a position separated from the first roller.

5. The image forming apparatus according to claim **4**, wherein the second roller is supported in the process cartridge and is configured to be moved between a first position and a second position; and

wherein the second separating part is configured to maintain the second roller in a third position between the first position and the second position.

6. The image forming apparatus according to claim **5**, wherein the second separating part is configured to hold the second roller such that the second roller is elastically movable from the third position to the first position and from the third position to the second position.

7. The image forming apparatus according to claim **1**, wherein the protective member further includes a retaining part protruding from the spacer in a protruding direction; and

wherein, when the protective member is attached to the process cartridge, the spacer is inserted between the first wall and the second wall in an insertion direction crossing the protruding direction and the retaining part engages the drum unit.

8. The image forming apparatus according to claim **7**, wherein the spacer has a wedge shape that grows narrower toward a downstream side in the insertion direction when viewed in the axial direction.

9. The image forming apparatus according to claim **1**, wherein the first wall and the second wall form walls of a path for guiding an image recording sheet from outside the process cartridge toward the photosensitive member; and

wherein, when the protective member is attached to the process cartridge, the spacer is inserted between the first wall and the second wall along the path in an insertion direction.

10. The image forming apparatus according to claim **9**, wherein the spacer has a wedge shape that grows narrower toward a downstream side in the insertion direction when viewed in the axial direction.

11. The image forming apparatus according to claim **1**, wherein the process cartridge further comprises a boss protruding outward in the axial direction;

wherein the housing includes a boss contact part that contacts the boss when the process cartridge is attached to the housing;

wherein the protective member further includes a boss engaging part configured to engage the boss when the protective member is attached to the process cartridge; and

wherein, when the process cartridge is attached to the housing and the protective member is attached to the process cartridge, the boss engaging part is arranged between the boss and the boss contact part.

12. The image forming apparatus according to claim **1**, wherein the drum unit further includes a positioning roller defining a second axis in the axial direction and rotatably supported on the drum unit about the second axis; and

wherein the developing unit is detachably attached to the drum unit, and when the developing unit is attached to the drum unit, the developing unit is positioned relative to the drum unit by contacting the positioning roller.

13. The image forming apparatus according to claim **12**, wherein the protective member further includes a retaining part configured to maintain the developing unit in a state of contact with the positioning roller.

14. The image forming apparatus according to claim **1**, wherein the housing further includes a drive input member configured to be moved between an advanced position and a retracted position in the axial direction, and configured to input a drive force into the process cartridge when the process cartridge is attached to the housing;

wherein the process cartridge further comprises a drive receiving unit configured to engage the drive input member to receive the drive force from the drive input member; and

wherein the protective member further includes a covering part positioned between the drive input member and the drive receiving unit so as to cover the drive receiving unit when the protective member is attached to the process cartridge.

15. An image forming apparatus comprising:

a housing;

a process cartridge detachably attached to the housing, the process cartridge comprising:

a drum unit including a photosensitive member; and

a developing unit including a developing roller, an accommodating portion configured to accommodate developing agent, and a first wall, the developing roller defining a first axis extending in an axial direction and being configured to rotate about the first axis and supply the developing agent to the photosensitive member, the first wall having a first surface and a second surface opposite thereto, the first surface extending in the axial direction and facing the developing roller; and

a protective member detachably attached to the process cartridge and including a spacer, the drum unit including a second wall having a third surface extending in the axial direction and facing the second surface, the spacer being disposed between the second surface and the third surface,

wherein the first wall and the second wall form walls of a path for guiding an image recording sheet from outside the process cartridge toward the photosensitive member, and

wherein, when the protective member is attached to the process cartridge, the spacer is inserted between the first wall and the second wall along the path in an insertion direction.

16. An image forming apparatus comprising:

a housing;

a process cartridge detachably attached to the housing, the process cartridge comprising:

a drum unit including a photosensitive member; and

a developing unit including a developing roller, an accommodating portion configured to accommodate developing agent, and a first wall, the developing roller defining a first axis extending in an axial direction and being configured to rotate about the first axis and supply the developing agent to the photosensitive member, the first wall having a first surface and a second surface opposite thereto, the first surface extending in the axial direction and facing the developing roller; and

a protective member detachably attached to the process cartridge and including a spacer, the drum unit including a second wall having a third surface extending in the axial direction and facing the second surface, the spacer being disposed between the second surface and the third surface,

wherein the housing further includes a drive input member configured to be moved between an advanced position and a retracted position in the axial direction, and configured to input a drive force into the process cartridge when the process cartridge is attached to the housing,

wherein the process cartridge further comprises a drive receiving unit configured to engage the drive input member to receive the drive force from the drive input member, and

wherein the protective member further includes a covering part positioned between the drive input member and the drive receiving unit so as to cover the drive receiving unit when the protective member is attached to the process cartridge.

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